What is Claimed is:

1. A method for protecting and transmitting the side information related to peak-to-average power ratio (PAPR) reduction in a multicarrier system, comprising the steps of:

(a) performing multicarrier modulation for the data to be transmitted and generating a data modulated signal, then executing a procedure related to said PAPR reduction;

(b) encoding said side information for generating coded side information;

(c) allocating a plurality of sub-carriers for transmitting said coded side information;

(d) performing multicarrier modulation for said coded side information and generating a side information modulated signal; and

(e) attaching said side information modulated signal to said data modulated signal for generating a transmitted signal;

wherein said PAPR reduction procedure is based on either the PAPR level of said data modulated signal or that of said transmitted signal.

2. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 1, wherein said encoding said side information is implemented through an error-correction coding procedure.

3. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 1, wherein said PAPR reduction procedure is based on either the PAPR level of said data modulated signal or that of said transmitted signal to determine PAPR reduction parameters.

4. The method for protecting and transmitting the side information related to PAPR

reduction in a multicarrier system as claimed in claim 3, wherein said PAPR reduction parameters are said side information.

5. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 1, wherein said PAPR reduction procedure is a partial transmit sequence method.

6. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 3, wherein said PAPR reduction procedure is based on the PAPR level of said data modulated signal, and said steps (b), (d), and (e) are performed after said PAPR reduction parameters have been determined.

7. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 4, wherein said PAPR reduction procedure is based on the PAPR level of said data modulated signal, and said steps (b), (d), and (e) are performed after said PAPR reduction parameters have been determined.

8. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 3, wherein said PAPR reduction procedure is based on the PAPR level of said transmitted signal, and said steps (b), (d), and (e) are performed during said PAPR reduction procedure.

9. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 4, wherein said PAPR reduction procedure is based on the PAPR level of said transmitted signal, and said

steps (b), (d), and (e) are performed during said PAPR reduction procedure.

10. A method for protecting and transmitting the side information related to peak-to-average power ratio (PAPR) reduction in a multicarrier system, comprising the steps of:

(a) performing multicarrier modulation for the data to be transmitted and generating a data modulated signal, then executing a procedure related to said PAPR reduction;

(b) encoding said side information and generating two groups of coded side information;

(c) allocating two groups of a plurality of sub-carriers for transmitting said two groups of coded side information respectively;

(d) combining one of said two groups of coded side information with said data modulated signal;

(e) modulating the other group of said two groups of coded side information and generating a side information modulated signal; and

(f) attaching said side information modulated signal to said data modulated signal for generating a transmitted signal;

wherein said PAPR reduction procedure is based on either the PAPR level of said data modulated signal or that of said transmitted signal.

11. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 10, wherein said said step (b) is implemented through an error-correction coding procedure and a parity-bit generation procedure.

12. The method for protecting and transmitting the side information related to PAPR

reduction in a multicarrier system as claimed in claim 10, wherein said PAPR reduction procedure is based on either the PAPR level of said data modulated signal or that of said transmitted signal to determine PAPR reduction parameters.

13. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 12, wherein said PAPR reduction parameters are said side information.

14. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 10, wherein said PAPR reduction procedure is a partial transmit sequence method.

15. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 12, wherein said PAPR reduction procedure is based on the PAPR level of said data modulated signal, and said steps (b), (e), and (f) are performed after said PAPR reduction parameters have been determined.

16. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 13, wherein said PAPR reduction procedure is based on the PAPR level of said data modulated signal, and said steps (b), (e), and (f) are performed after said PAPR reduction parameters have been determined.

17. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 12, wherein said PAPR reduction procedure is based on the PAPR level of said transmitted signal, and said

steps (b), (e), and (f) are performed during said PAPR reduction procedure.

18. The method for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 13, wherein said PAPR reduction procedure is based on the PAPR level of said transmitted signal, and said steps (b), (e), and (f) are performed during said PAPR reduction procedure.

19. An apparatus for protecting and transmitting the side information related to peak-to-average power ratio (PAPR) reduction in a multicarrier system, comprising:

a multicarrier modulator for modulating data onto multiple sub-carriers and generating a data modulated signal, wherein said multicarrier modulator comprises a PAPR reduction device to reduce the PAPR level of said data modulated signal and reserves a plurality of sub-carriers for protecting and transmitting said side information;

a side information coding and modulation device for coding and modulating said side information onto said plurality of sub-carriers and generating a side information modulated signal;

a composer for composing said data modulated signal and said side information modulated signal, and generating a transmitted signal; and

a parameter control device for PAPR reduction for determining said side information according to the PAPR level of said data modulated signal.

20. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 19, wherein said parameter control device for PAPR reduction generates PAPR reduction parameters, and said

PAPR reduction parameters are said side information.

21. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 20, wherein said multicarrier modulator generates said data modulated signal according to said PAPR reduction parameters and feedback to said parameter control device for PAPR reduction.

22. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 19, wherein said parameter control device for PAPR reduction determines said PAPR reduction parameters according to a PAPR reduction procedure, then said side information coding and modulation device refers to said PAPR reduction parameters as said side information for coding and modulating said side information onto said plurality of sub-carriers.

23. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 19, wherein said parameter control device for PAPR reduction determines said PAPR reduction parameters after phase optimization, and sends said PAPR reduction parameters to said side information coding and modulation device.

24. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 23, wherein said parameter control device for PAPR reduction comprises a phase mapper and a phase optimization unit, and said phase mapper provides said PAPR reduction parameters for said multicarrier modulator.

25. The apparatus for protecting and transmitting the side information related to PAPR

reduction in a multicarrier system as claimed in claim 24, wherein said phase mapper is implemented by an encoder and an M-ary phase-shift keying (PSK) mapper, and said encoder is followed by said M-ary PSK mapper and proceeds the error-correction coding of said PAPR reduction parameters.

26. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 25, said side information coding and modulation device further comprising:

a parity-bit generator for coding the output from said encoder and generating an encoded codeword;

a symbol mapper for mapping the encoded codeword from said parity-bit generator to a corresponding sequence; and

a partial N-point Inverse Fast Fourier Transform (N-IFFT) for performing the modulation of N-IFFT according to the frequency arrangement of said corresponding sequence and generating said side information modulated signal.

27. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 19, said side information coding and modulation device further comprising:

an encoder for coding said side information from said phase optimization unit and generating an encoded codeword;

a symbol mapper for mapping the encoded codeword from said encoder to a corresponding sequence; and

a partial N-point Inverse Fast Fourier Transform (N-IFFT) for performing the

modulation of N-IFFT according to the frequency arrangement of said corresponding sequence and generating said side information modulated signal.

28. An apparatus for protecting and transmitting the side information related to peak-to-average power ratio (PAPR) reduction in a multicarrier system, comprising:

a multicarrier modulator for modulating data onto multiple sub-carriers and generating a data modulated signal, wherein said multicarrier modulator comprises a PAPR reduction device to reduce the PAPR level of said data modulated signal and reserves a plurality of sub-carriers for protecting and transmitting said side information;

a side information coding and modulation device for coding and modulating said side information onto said plurality of sub-carriers and generating a side information modulated signal;

a composer for composing said data modulated signal and said side information modulated signal, and generating a transmitted signal; and

a parameter control device for PAPR reduction for determining said side information according to the PAPR level of said transmitted signal.

29. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 28, wherein said parameter control device for PAPR reduction generates PAPR reduction parameters, and said PAPR reduction parameters are said side information. .

30. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 29, wherein said multicarrier

modulator generates said data modulated signal according to said PAPR reduction parameters.

31. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 28, wherein said parameter control device for PAPR reduction determines said PAPR reduction parameters according to a PAPR reduction procedure, and during that time, said side information coding and modulation device refers to said PAPR reduction parameters as said side information for coding and modulating said side information onto said plurality of sub-carriers.

32. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 28, wherein said parameter control device for PAPR reduction selects said PAPR reduction parameters during phase optimization, and sends said PAPR reduction parameters to said side information coding and modulation device.

33. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 32, wherein said parameter control device for PAPR reduction comprises a phase mapper and a phase optimization unit, and said phase mapper provides said PAPR reduction parameters for said multicarrier modulator.

34. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 33, wherein said phase mapper is implemented by an encoder and an M-ary phase shift keying (PSK) mapper, and said encoder is followed by said M-ary PSK mapper and proceeds the error-correction

coding of said PAPR reduction parameters.

35. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 33, said side information coding and modulation device further comprising:

a parity-bit generator for coding the output from said encoder and generating an encoded codeword;

a symbol mapper for mapping the encoded codeword from said parity-bit generator to a corresponding sequence; and

a partial N-point Inverse Fast Fourier Transform (N-IFFT) for performing the modulation of N-IFFT according to the frequency arrangement of said corresponding sequence and generating said side information modulated signal.

36. The apparatus for protecting and transmitting the side information related to PAPR reduction in a multicarrier system as claimed in claim 28, said side information coding and modulation device further comprising:

an encoder for coding said side information from said phase optimization unit and generating an encoded codeword;

a symbol mapper for mapping the encoded codeword from said encoder to a corresponding sequence; and

a partial N-point Inverse Fast Fourier Transform (N-IFFT) for performing the modulation of N-IFFT according to the frequency arrangement of said corresponding sequence and generating said side information modulated signal.